WASHINGTON
SCIENCE TRENDS

HIGHLIGHTS

* Trends in the Making
* Defense Spending
* Navy Energy Needs
* Research Checklist
* Publication Checklist

Vol. II No. 21 August 10, 1959

Trends in the Making

Khrushchev Visit

Administration officials are weighing an invitation to Soviet Premier Nikita S. Khrushchev to witness the launching of an elaborate meteorological satellite at Cape Canaveral in late September. Although the launching vehicle will be the relatively reliable Thor-Able some officials fear that a misfire would "backfire" -- in a public relations sense. There is strong feeling, however, that the invitation would serve to demonstrate this nation's interest in peaceful, scientific space exploration.

Military Spending

Defense Secretary Neil McElroy has this blunt warning for industry: "Marginal" missile and aircraft programs "will disappear" in the 1961 budget now being planned. He has issued orders to the various service secretaries that their budget must remain at or below the current figures. McElroy foresees cancellation of several major projects, such as the Regulus II which was cut this year. The North American long-range interceptor (F-108) is widely rumored to be slated for cutbacks. (See Page Two for a summary of 1960 Budget actions)

CBR Research

Strong backing from the House Committee on Science and Astronautics this week for increased research on Chemical, Biological and Radiological (CBR) warfare. The legislators note that present research constitutes but one-one thousandth of the total defense budget and they urge serious consideration of proposals that this level of support be at least trebled.

Industrial Radiation

Among 22 new contracts totalling $800,000 just awarded by the Atomic Energy Commission for radioisotope research three appear to have unusual industrial applications. The Picker X-Ray Corp., Cleveland, receives $42,000 to develop and demonstrate the feasibility of a self-powered x-ray tube for inspection, testing and possible medical diagnosis. Westinghouse Electric, East Pittsburgh, Pa. receives $23,500 for the development of transparent polyethylene by nuclear radiation. Technical Research Group, Syosset, Long Island, receives $35,000 to determine whether pure silicon can be produced by Cobalt-60 irradiation of silane or other silicon compounds.

Defense Appropriations

Months of Congressional turmoil have finally resulted in a patch work version of the Defense Appropriations bill submitted by the Administration in January. Changes wrought by the legislators emphasize safety modification, modernized training and offensive rather than defensive missions for the Air Force. The Army loses out on Nike-Hercules research but gains funds for modernization of its air and ground operations. Navy changes, but for addition of a nuclear attack carrier, are few.

Among programs which were in jeopardy:

Jet Utility Trainers -- North American Aviation won a long gamble on its T-39 (UTX) a light-weight, twin engine jet proficiency trainer which can also be used for light-weight transport duties. Initial appropriation of $24.5 million will go for 35 trainers to be built in Inglewood, Calif. Powerplant will be two J-60-F-S turbojets.

Jet Navigation Trainers -- Air Force is expected to decide shortly between Lockheed and McDonnell Aircraft versions of the UCX a high-speed light-weight aircraft to be used for navigator and electronic countermeasure training and for airway monitoring. Appropriation of $23.4 million goes for 14 aircraft using four J-60-P-3 turbojet engines.

Strategic Transport -- No funds are appropriated for the swing-tail four engine jet transport (C-Jet) proposed by Boeing, Douglas and Convair. The legislators suggested that more studies will be required as to mission requirements before any procurement can begin.

F-27 Procurement -- The House turned down some $11 million for this Fairchild transport while the Senate voted for the funds. The appropriation was eliminated in a House-Senate compromise, with the understanding that the Air Force could shift funds from other programs if it chooses to do so. The F-27 (CX) was planned for replacement of the old C-45 and C-47.

Mace -- The House knocked out all $127.5 million planned for the new version of this Martin non-ballistic missile. Senate voted for funds to at least meet NATO commitments. Compromise allocates no funds specifically for Mace but the Air Force can use other funds for procurement if the Defense Department certifies that the Mace is "essential for the military posture of the country."

Nike-Hercules -- House and Senate agreed to cut research for this program by some $10.8 million. In addition, some $100 million in Hercules funds are to be "re-programmed" for "Army Modernization" -- whatever that turns out to be.

Bomarc -- Heavy cuts here, too. Compromise calls for $79.9 million for this Air-Force-Boeing Program. Original request was $162.9 million and this was later cut to $129.9 million under the revised air defense plan. The legislators still thought this was too much money for defense rather than offense.

Navy -- More money than ever before for anti-submarine warfare. The legislators added some $137.3 million to the $1.2 billion requested by the Administration. Congress ignored Administration requests for a conventional aircraft carrier and substituted some $35 million for procurement of long-lead items for a nuclear attack flat-top.

Navy Energy Requirements

Varied and specialized power requirements of the Navy has led to a search for new energy sources and perfection of existing sources and techniques. Here is a summary of requirements as listed by Rear Adm. Rawson Bennett, Chief of Naval Research:

* Thermoelectric Propulsion: Navy Bureau of Ships is investigating the potential advantages of compact size, efficiency and silence in the thermoelectric generator. In ships, nuclear power would be used for heat generation and the sea would serve as a heat sink. This would have the added advantage of eliminating the need for boilers, stacks, flues and other items. Since the process is reversible such applications as heat pumping, air conditioning and other devices for precise temperature control "appear feasible."

* Miniature Power Generator: Navy and other services urgently require a miniature light-weight power generator capable of unattended operation for periods of one thousand hours or more under all types of climatic conditions with power outputs of 100 watts. Intensive research has demonstrated that no significant progress can be made until the physical, chemical and thermodynamic characteristics of possible working fluids for closed power cycles is determined.

  Particular interest is expressed in using substances other than water -- such as fluorinated hydrocarbons. With such fluids, it is stated, the turbine wheel can be decreased appreciably, while inherent high density preserves a low turbine weight to horsepower ratio. In certain naval applications large gears which are now prime sources of detectable noise might be eliminated. Principal unknown area is the size of the supercritical heater or boiler required.

* Electrochemical Power -- Navy finds an urgent need for studies which will lead to systems in which the rate of electrochemical oxidation is sufficient at low temperatures to provide a practical power source. Present systems are said to deliver useful amounts of power only at elevated temperatures, generally between 500 and 800 degrees. Navy is currently investigating the electrochemical oxidation of carbon-containing gases at temperatures below 100 degrees C. using aqueous electrolytes. Gases under study include carbon monoxide, methane, ethane, ethylene and acetylene.

* Battery Power: - Contract work is currently under way on a new type of electrolytic generator evolved from a standard commercial-type nickel-cadmium alkaline battery said to hold "real promise" as an efficient oxygen generator. By substituting sheet nickel plates for nickel oxide plates, oxygen gas is produced around the inert nickel without giving off hydrogen except at high overvoltages. This is said to eliminate the hazard of explosion.

* Biochemical Power - Navy is working on a photosynthetic gas exchanger which could remove waste carbon dioxide from the atmosphere and manufacture oxygen in one continuous operation. Plans call for installation of a unit using algae on board a nuclear submarine. One model, using artificial illumination as the light source, would be about four cubic feet in volume and use about five kilowatts of power in light to provide oxygen and consume carbon dioxide for one or two men.

RESEARCH CHECKLIST

( ) Exploding Wire Experiments: Special high-power capacitors have been developed by the Navy for use in its exploding-wire project -- an attempt to produce a short-duration, high intensity source with a very high temperature for time-resolved spectral studies in the visible, ultraviolet and x-ray regions. The pulsed-power system consists of a fast water capacitor which is pulse charged and unloaded through the exploding wire when the capacitor reaches full charge. It is expected that 20 billion watts of power can heat the wire to temperatures near one million degrees.

(R&D by Analysis and Theory Branch, Radiation Division, Naval Research Laboratory, Washington 25, D.C.)

( ) Tung Oil Applications: Agriculture Department, in cooperation with industry, has developed a new method for processing tung oil vehicle which removes the danger of gelling during "cooking" -- said to be the major drawback to widespread commercial use. Relatively small amounts of zinc resinate are added to control gelling or polymerization. Patent is available for licensing to U.S. manufacturers without cost. Applications include varnishes, floor sealers and paint vehicles.

(Some details available. Free. Write Service Department, Washington SCIENCE TRENDS, 1120 National Press Building, Washington 4, D.C.)

( ) Glass Fiber Research: Studies at the Armour Research Foundation have led to a new method for increasing the radiation sensitivity of glass and may result in a more efficient system for detecting hazardous gamma radiation. Glass fibers which can be calibrated like a thermometer are used, in connection with a new technique for coating with lower refracting glass. Exposure to radiation darkens the fibers, permitting an immediate reading.

(Further Information available from J.A. Miller, Armour Research Foundation, 35 West 33rd St., Chicago 16, Ill.)

( ) Digital Communication System: An all-digital communication and switching system for the Army is said to automatically by-pass battle-damaged lines and re-route messages over the fastest available path. Information from computers, radar, analog signals, teleprinters, tape-readers and voice and telemetering systems can be handled. A Delta Pulse Code Modulation system transmits speech signals in the form of electrical pulses which are reconverted at destination.

(R&D by ITT Laboratories, Nutley, N.J. and U.S. Army Signal Research and Development Laboratory, Ft. Monmouth, N.J.)

( ) Transistor Test Set: Transistor test set said to be portable, versatile and inexpensive has been developed for Army field use. Measurements can be made of collector cut-off current, emitter cut-off current and the d-c large-signal common-emitter current gain -- basic transistor parameters.

(Report available. 8 pages. 50 cents. Write OTS, U.S. Dept. of Commerce, Washington 25, D.C. for PB 151300)

( ) Balloon Meteorology: Air Force has designed a one-quarter pound balloon containing no electronic equipment, moving parts or batteries as a payload for the ARCAS meteorological sounding rocket. The balloon, designated as ROBIN, is said to be capable of providing inexpensive and reliable information on wind velocity, density, pressure and temperature between 100 and 200 thousand feet. It is ejected from the nose cone and tracked by ground radar.

(Studies by Geophysics Research Directorate, Air Force Cambridge Research Center, Bedford, Mass.)

( ) Tellurium Research: U.S. Bureau of Mines is seeking new sources for tellurium in expectation of increased demand for applications as a semiconductor material and in thermoelectric devices. Among possible sources to be investigated are hydrocarbons, slag piles, blast-furnace gases and mill tailings. Efforts will also be made to improve tellurium-detection methods and analytical techniques.

(R&D by U.S. Bureau of Mines, Laboratory, Salt Lake City, Utah and Spokane, Wash.)

( ) High Temperature Thermocouples: Temperature measurement of molten titanium during casting has not been possible with standard thermocouples because of the problem of chemical reactivity. The Navy has found that a graphite-tungsten system is feasible because titanium can be cast into cold-graphite molds with a minimum of contamination. At the present state of development, the high-temperature thermocouple can be used for comparative measurements between similar size melts or for multiple points within a single melt.

(R&D by Metallurgy Division, Nonferrous Alloys Branch, U.S. Naval Research Laboratory, Washington 25, D.C. Problem No. Mol-ol)

( ) Dielectric Materials: A study by the Johns Hopkins University indicates that polyethylene and polytetrafluoroethlyne are virtually unaffected by tropical exposure. These were among 10 dielectric material specimens selected for determination of the degradative effects of moisture. Most other materials showed a deterioration of volume properties.

(Report available. 76 pages. $2. Order PB 151 014 from OTS, U.S. Department of Commerce, Washington 25, D.C.)

( ) Pressure Sensing Devices: Studies at the Langley (Va.) Research Center have sought a means for the reduction of static-pressure sensing errors in aircraft operating at transonic speeds. Methods were devised for measurements of these errors and experimental probes were designed and tested. The studies have application in flight safety and in accurate performance of pressure-sensitive automatic control systems of airplanes and aerodynamic missiles.

(Report available. 58 pages. Single copies free. (Write National Aeronautics and Space Administration, 1520 H Street, N.W. Technical Information - Code BID for NASA Report 18)

PUBLICATION CHECKLIST

( ) Helium-Conservation Plans: new proposed legislation for construction of up to12 new plants to extract helium from natural gas before it goes to fuel markets. 10 pages. Free. (Write Information Service, Department of the Interior, Office of the Secretary, Washington 25, D.C. for P.N. 59050-59 and 58385-59)

( ) Radioisotopes: Brief summaries and source notes on some 492 selected references on the broader aspects of isotope utilization in the physical and biological sciences. Covers material in scientific journals during the period 1948-1957. 30 pages. $1. (Write OTS, U.S. Department of Commerce, Washington 25, D.C. for TID-3519)

( ) Fallout Control: A Stanford Research Institute study surveying possible means of controlling radioactive fallout from nuclear tests. (SCIENCE TRENDS, Aug. 3, 1959) Includes a number of references on the subject. $3.50 (Write OTS, U.S. Department of Commerce, Washington 25, D.C. for SRIA-3)

( ) Lunar Probes: The official Space Technology Laboratories summary in detail of the Thor-Able lunar probes which took place during the Summer and Fall of 1958. 84 pages. Single copies free. (Write Technical Information -BID, National Aeronautics and Space Administration, 1520 H Street, N.W., Washington 25, D.C. for NASA Memo 5-25-59W)

( ) Engineering Drawings: A Military Standard which defines the types of engineering drawings prepared by the Departments of the Army, Navy and Air Force and by contractors. The drawings cover engineering for construction, evaluation, inspection, identification, maintenance and manufacturing. 53 pages. 40 cents. (Write Superintendent of Documents, Government Printing Office, Washington 25, D.C. for Pub. No. D 7.10:7)

( ) Electronic Technicians: A Navy Training Course including information on electronic safety precautions, component and equipment nomenclature, electronic installations, test equipment, use of the oscilloscope, synchroscope, switchboards, sonar and similar material. 839 pages. $2.50. (Write Superintendent of Documents, Government Printing Office, Washington 25, D.C. for Pub. D 208.11:El 2/5/959)

( ) Nuclear Reactors: A report by the National Research Council on Reactors for University Research. 31 pages. 75 cents. (Write Publications Office, National Academy of Sciences, 2101 Constitution Avenue, N.W., Washington 25, D.C. for Nuclear Science Series Report No. 28)

( ) Pressure Measurements: A collection of 31 papers from various NATO countries of particular interest to the aerodynamicist. Covers such subjects as pressure transducers, calibration problems, Mach number gauges and data handling. 203 pages. Single copies free. (Write Technical Information - BID, National Aeronautics and Space Administration, 1520 H Street, N.W., Washington 25, D.C. for AGARD Report 163)

( ) Energy Conversion: Unclassified technical papers and discussions of a Government-sponsored seminar on advanced energy sources and conversion techniques including chemical, thermal, solar, nuclear, electrical and mechanical. Seminar held at Pasadena, Calif. in Nov. 1958. Just published. 256 pages. $4. (Write OTS, U.S. Department of Commerce, Washington 25, D.C. for PB 151 461)